Blending Administrative and Clinical Needs: The Development of a Referring Physician Database and Automatic Referral Letter

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Abstract:

The development of a system to collect and verify the name of a patient's referring physician and link that to the automatic production of a referral letter and discharge summary is described.

Introduction:

Hospital information systems (HIS) are often split between clinical and administrative/financial functions. Several large hospital information systems have specifically or historically chosen to separate these (and other) tasks completely, and there are several examples of efforts to coordinate such systems. [1] We present an example of a project recently completed at our institution that provides support for the converse: that clinical concerns and administrative or financial needs often can utilize the same database to mutual benefit.

The Problem:

The New England Deaconess Hospital is a 431 bed academic acute tertiary care institution with an average of 12,000 to 13,000 discharges per year. It obtains the majority of it's patients from outside referrals, and fully 17-20% of its admissions by transfer from other institutions. Several ongoing clinical and strategic planning concerns that result from this structure have been difficult to address in the absence of up-to-date information on referring physicians. Administratively, the hospital has previously had little success in tracking physician referral patterns. From a strategic planning perspective it is important to have accurate data on which physician groups in which communities are sending patients to the institution, and what types of diseases and acuity are being referred. Clinically, a potential untoward side effect of having a large referral patient population is that the physicians who take care of a patient's acute, serious problems in the hospital are often *not* the same physicians who will take care of the patient in follow-up. Therefore, the rapid transmission of accurate, useful clinical information to these referring physicians is seen as crucial to maintaining high standards and continuity of medical care. Both of these issues have been addressed by the development of a referral physician database that is continuously updated as a byproduct of patient care.

We saw this need for accurate physician referral data and the desire for timely transmission of clinical information to these referring physicians as an excellent opportunity to combine data processing functions traditionally divided between administrative and clinical systems. We had previously created and continue to develop an on-line, partially automated discharge summary creating tool within the same information system that accomplishes all of the patient registration, admission, discharge and transfer (ADT) functions.[2] Currently, this system's use is voluntary, but through various incentives has become quite successful, and approximately 60-80% of the discharges from the hospital have summaries created and stored on-line. By adding a component to the registration package that captures, verifies and records the local or referring physician's name and address, and combining this function with the discharge summary product, we were able to address both concerns. This modification to our HIS

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system now maintains and updates a referring physician database linked to relevant clinical and financial data, automatically produces a letter from the attending physician of record at our institution to that referring physician, and appends a copy of the automated discharge summary. The letter and summary can then be mailed (within 24 hours of discharge) to the referring physician.

System Environment:

The hospital's overall computerized patient care system is known to users as ODISY (Online Deaconess Information SYstem). This is an IBM mainframe-based system which is written using IBM's Patient Care System/Application Development System architecture and the PL/1 programming language. Data management is through IMS databases. Major hospital components of the system include admissions, order entry from nursing stations for all major ancillaries (including pharmacy, and medical records coding and abstracting. Multiple computer terminals are available at each nursing station. Nursing staff, unit coordinators and ward secretaries have used the system for many day-to-day functions since the system's inception in 1982.

Technical Implementation:

The admissions system is mounted on this same system and utilizes Spectrum Healthcare Solution's PCS/ADS and other CICS-based software. Collection of referring physician data and maintenance of a master file of referring physicians were integrated with this system. This process was technically straightforward.

First, a publicly-available file was purchased from the Massachusetts Board of Registry in Medicine. This file contained records for all physicians licensed in the state. It included practice address, specialties, hospital privileges, and medical school. This file was uploaded from a PC to the mainframe. It was then converted to a standard (VSAM) file with indexing by both the unique Board of Registry identification number and physician name. The record layout was altered to exclude some uninteresting fields and to include location of residency and other fields of potential value. Screens and other software for online display and update were written using PCS/ADS and the PL/1 programming language. This constituted the baseline master file of referring physicians.

The hospital's standard inpatient admission screen flow was altered to allow admitting clerks to access the file through a partial or full name search. Input to the name search presents a list of matching names and addresses, pulled from the on-line master file. Selection from the list records the Board of Registry number in the generalized patient database (an IMS structure). If no satisfactory name match is found on the list, the clerk is invited to key in the referring physician's full name and address, and this information is recorded in lieu of the Board number.

Each week a batch program produces an "exception report" by searching the patient database to find patients admitted during the past week for whom a physician from the master file was not recorded. If a name and address were keyed in, these are displayed. Any of these which are not in the master file (out-of-state referrals, for example) are then evaluated, checked for accuracy, and then added to the master file.

Finally, in addition to summary batch reports, the referring physicians for each inpatient, as well as the master file, are included in synoptic patient-based files periodically loaded into a flatfile database (IBM's Information Center) for further analysis and *ad hoc* reporting.

Letter-quality printing for communications back to the referring physician presented some technical challenge since it was not deemed practical to purchase a laser or equivalent quality mainframe printer for the anticipated low volume. A standard-brand PC laser printer was purchased along with a hardware protocol conversion device to allow printing directly from the mainframe system. This produces very high-quality letter and allows interleaving of hospital stationary for the letter with plain paper for the discharge summary.

Procedural Implementation

Figure 1 illustrates the general flow of information in the system. The physician "Master File" (which includes all licensed Massachusetts physicians as well as our updates and revisions) can be accessed during admission, preadmission, confirm preadmission, update or as an inquiry function. The information is requested on an individual screen which can be easily exited via a program function key if the physician's name is not available; once the information is obtained the screen will not

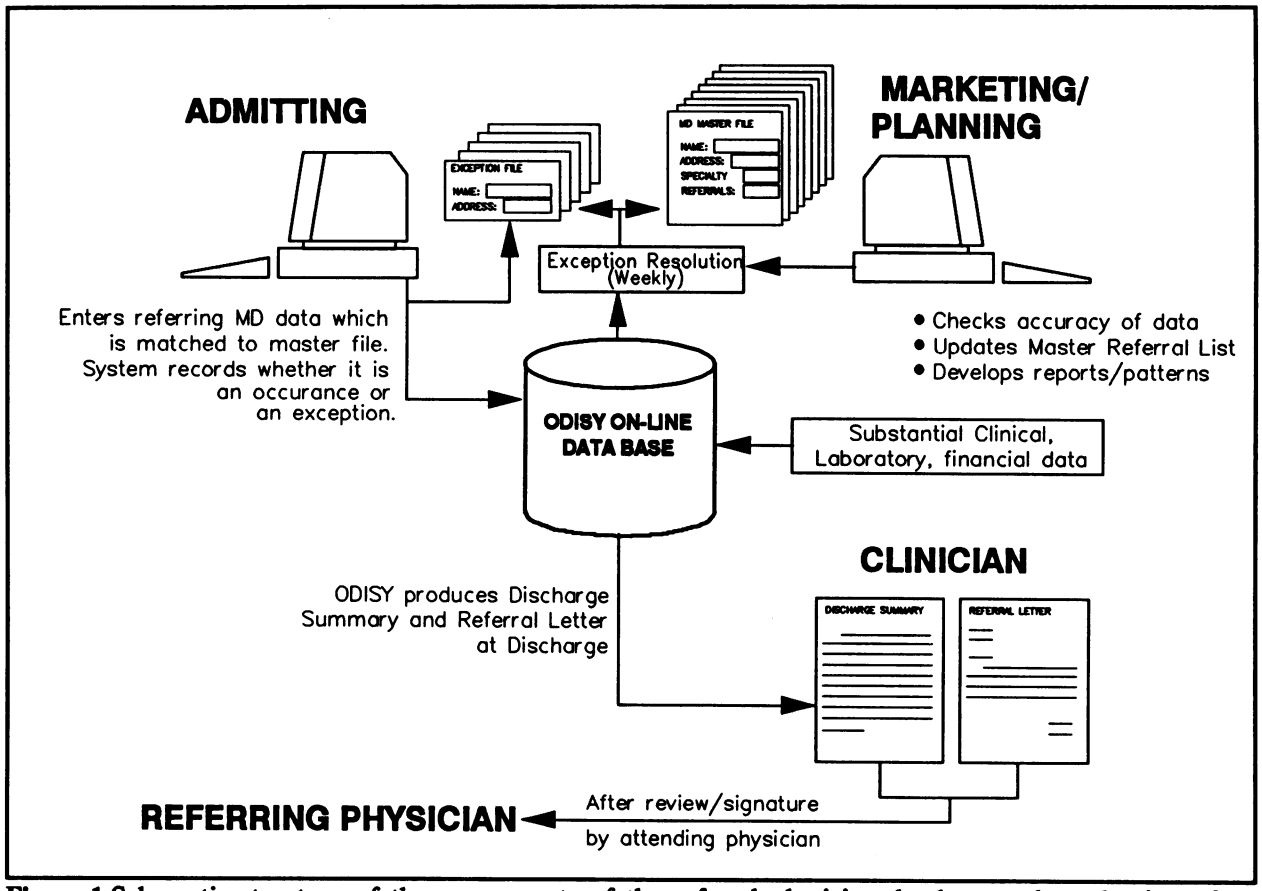

Figure 1:Schematic structure of the components of the referral physician database and production of an automatic letter to the referring physician.

appear during subsequent processing of that account, although it can be recalled for update. A straight alpha search is done and all appropriate physician names will appear; the correct one can be selected by line and will be attached to that admission. If the physician is not in the data base the admitter is able to free form as much information as is available. These "exceptions" are presented by weekly batch report to the Marketing and planning Department, who verify the accuracy of the information and add those names to the Physician Master File.

The link to referring physician is then used in several other settings. Batch reports are generated from the patient record files and transferred into summary files of physician referring patterns; these are analyzed and maintained by the marketing department. Finally, at the time of discharge, the system automatically produces a letter from the attending physician to the referring physician, attached to a copy of the partially automated discharge summary. A sample letter is shown in Figure 2, the discharge summary product has been described elsewhere. [2]. We are currently piloting the construction and distribution of the referral letter in one selected division of our hospital, the Joslin Diabetes Center's Diabetic Teaching Unit. This unit was chosen because the patients are reasonably similar, a large portion have primary providers not at the Deaconess, and the attending staff feel that prompt transmittal of their evaluation and treatments to the patient's personal physician is particularly important. The attending physician will receive the referral letter and the discharge summary within 24 hours of discharge, and can decide whether to send it to the referring physician or not.

Since patients are admitted to the hospital by several different mechanisms, modifications to the specific protocol were designed to increase the capture of useful information. Referring physician information is most reliably obtained from the admitting physician or their staff when the hospital admission reservation is made. The current

reservation system is manual; therefore forms were redesigned to include referring doctor name and address. The inquiry function in ODISY can be accessed to clarify spelling and address information prior to the point of admission avoiding delays for patient and staff during peak hours. If a patient is transferred by ambulance from another facility we will take the admitting physician at the other facility as the referring doctor unless we have other specific information. If there is no referring information available at the time of the admission interview the admitting officer will ask the patient who referred them to the Deaconess; if they are unsure, the name of their Primary Care Physician will be requested.

The addition of this function required communication with and training of personnel from both reservations and admitting. The importance of defining and strengthening our referral channels was explained as well as the long term goal of linking this to the discharge summary and providing important clinical information to the local physician. Laminated cards defining referring and primary physicians were put in each work area. Memos were prepared for off shifts in admitting and for the physicians so that all groups were prepared for the new initiative. As the modifications use the same screen flows and common user-interface; the process was quickly accepted and mastered by the admitting staff.

Results of Use:

Data is available for the first six months of operation of the program. The names of referring physicians were collected for 36% of the total admissions in February, 44% in March, 45% in April, 46% in May, 47% in June and 45% in July. The admitting staff obtained the names from both patients who were being admitted and the physicians office staff when a bed reservation was made. The most reliable source of referral information comes from the reservation process as patients are not always certain of their referring physicians. Initially, the names of referring physicians were not being collected on patients admitted through the Emergency Room, but this began on July 31, 1991. The results from February and March are higher at 47% and 56%, respectively, if the Emergency Room patients are excluded from total admissions.

A seemingly innocuous procedural decision has made it difficult to assess exactly how many admissions are derived from ouside sources. If the patient didn't know or wasn't asked about his/her referring physician, that field is left blank. However, to avoid confusion in the admitting process,the field is also left blank if the patient *does not have* a referring physician, and is under the primary care of the admitting attending. Consequently, the 50-60% capture rate is an underestimate of the program's sucess; we do not obtain 100% of our admissions from referral. A field to address this will be included in a revised version of the program.

During the first six months, the majority of failures to obtain a referring physician were due to human (admitting and patient) omission. I addition, a spelling error either on the part of the patient or the admitter can result in a mismatch with the master file. In spite of these obstacles, the program seems to be an increasing success.

Findings Regarding Referral Patterns:

During the first six months of operation, 359 names of referring physicians were added to the master file by the Marketing/Planning Department. The breakdown of physicians was as follows: 56 in Massachusetts, 295 out-of-state and 8 out of the country. Twenty percent of our admissions each year come from patients who live out-of-state, based on historic data provided by the zip code location of their home addressees. An average of 15% of the names of referring physicians who are listed on the weekly report are from out-of-state, and include all the New England States, Florida, Louisiana, New York, Ohio and a few others. The majority of the patients who have no referring physician listed are from Massachusetts, and either appear to be unclear of the name of their physician, or have a Deaconess physician as their primary care provider.

The physicians at New England Deaconess Hospital are known for their expertise in the complications and treatment of diabetes, cardiology and oncology. The weekly report for the Marketing Department includes the admitting diagnosis for all patients. The early data is consistent with our prior assumption that a majority of physicians who refer to our institution predominately referred these three conditions. This was especially true for patients referred from out of state.

Future Enhancements and Evaluation:

This information is clearly useful to the hospital

and to our physicians in determining our service areas and defining our referral patterns. There has been general consensus among the medical staff that timely information flow to our referring physicians is critically important to maintain high quality patient care. When a patient's follow-up visits are not with the in-hospital provider, accurate information regarding hospital course, diagnosis, medication and other therapeutic changes are necessary for appropriate follow-up care. It will be difficult to rigorously test whether this product actually improves the care of referred patients. We can (and will) assess attending and referral physician satisfaction with the letter and summary, but finding actual mortality, readmission, or morbidity differences is virtually impossible given the lack of complete follow-up and rarity of morbid events. However, there is substantial *a priori* belief that the timely distribution of such information can only help patient care.

If the pilot program is successful and well received by attending and referring staff, several enhancements are proposed. Electronic transfer of the letter and summary to the attending physician so that they can be locally modified and more easily personalized is planned. The expansion of the service to include more than one referring physician, as well as letters and summaries sent to all of the physicians who consulted on the patient is planned as well.

Conclusions:

We have demonstrated that data-processing needs from different, traditionally distinct departments in a hospital can be successfully addressed from the same central data base. Although there is no programmatic or database design innovation in this work, we feel the successful implementation of this project provides support for our intuition that many requests for information system programs are most efficiently provided by incremental, problem-directed modifications of existing HIS systems.

References:

1.) Ellis KK. Integration of heterogeneous systems into a patient information network. *Proceedings of the 13th Annual Symposium on Computer Applications in Medical Care*, The IEEE Computer Society Press. 1990: 740-749.

2. Roberts MS, Zibrak JD, Siders A, Zullo N, Peterson M. The development of an on-line, Partially automated discharge summary and core clinical database in an existing hospital information system. *Proceedings of the 13th Annual Symposium on Computer Applications in Medical Care*, The IEEE Computer Society Press. 1989; 649-653.

{DATE}

{PHYSICIAN NAME(SALUTATION, FIRST, MI, LAST)}
{PHYSICIAN ADDRESS 1}
{PHYSICIAN ADDRESS 2}
{PHYSICIAN CITY} {PHYSICIAN STATE} {PHYSICIAN ZIP}

Dear {PHYSICIAN NAME(SALUTATION, LAST)};

This letter is in reference to {PATIENT NAME}, a patient of yours who was admitted to the {Deaconess Hospital/Joslin Clinic} between {ADMIT DATE} and {DISCHARGE DATE}. {She/He} was admitted with a diagnosis of {ADMITTING DIAGNOSIS}.

A copy of {his/her} discharge summary is attached for your perusal. Feel free to call me if you have any questions about the care that she received while she was here.

Sincerely,

{ATTENDING NAME}

Figure 2. Sample letter with various fields that are inserted from the patient database and referral physician master file.